APPlication I: Matching Apps for Students with Low-Incidence Disabilities

David Lojkovic

In this chapter, we provide three examples of how teachers serving students with significant disabilities may use the *Apps Consideration Checklist* to determine a good match between the features of an app and the student characteristics as they work toward mastery of an instructional objective. The examples show how teachers develop procedures to teach the skill using the app and design assessment procedures to monitor progress.

Scenario 1: Albert

Albert is a 7-year-old male with a diagnosis of autism. He has intellectual functioning in the severe range. He is functionally nonverbal. He communicates his needs and wants using a low-tech communication board and graphic symbols. He has a functional picture vocabulary of around 30 symbols, including "bathroom," "please," "thank you," "snack," "stop," "more," "I want…," "I need…," "yes," "no," "enough," and "water." Albert has no vision or hearing deficits.

Albert attends a public elementary school, where he spends the majority of the day in a self-contained special education classroom except when he is at lunch in the school cafeteria and when he must transition to the gym for adapted physical education. He follows an adapted curriculum based on common core standards and functional skills. He receives speech therapy, occupational therapy, and physical therapy as related services. One of Albert's goals in the area of communication is to increase his functional vocabulary through the use of a communication device. At his last IEP meeting, his IEP team considered his strengths and weaknesses, the environments in which he functions now and will function in the future, and his learning objectives. They decided that it would be appropriate for Albert to begin to learn how to use an iPad equipped with the app Sono Flex, by Tobii (**http://www.tobii.com/assistive-technology/global/products/software/sono-flex/**). Rather than obtain a separate augmentative and alternative communication (AAC) device for Albert, the team decided to obtain an iPad because it can function as an AAC device and can be fitted with multiple apps to assist and reinforce instruction in varying domains.

There are several AAC apps available. However, after evaluating the Sono Flex app with the *Apps Consideration Checklist*, the team determined that this was the most appropriate for Albert because he has the requisite motor skills to access the app, the visual skills to see the picture accompanying the text, and the auditory skills to hear the voice output feedback. In addition, the app is easily navigable, high-frequency phrases and words are preset, and an option to type in words for which there is no picture in the visual lexicon is included. A screen from the app is shown in the sidebar, Screen Shot from Sono Flex App. While there is no help option on the app itself, the company's website offers troubleshooting information and contact information in case additional assistance is needed. In addition, the iconography of the picture symbols is consistent with the communication board that Albert currently uses.

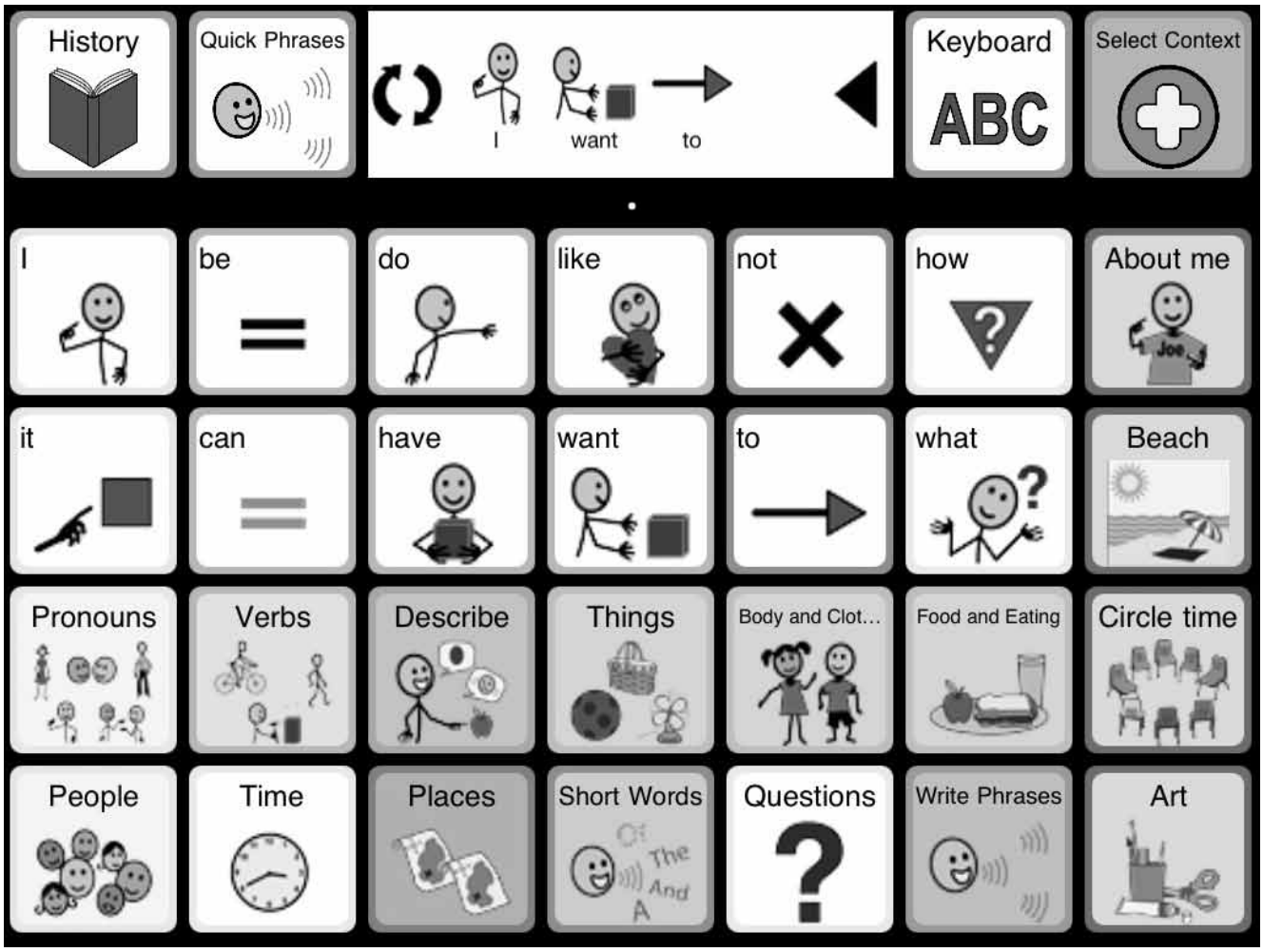
Albert's teacher wants to increase his use of novel vocabulary words or phrases (i.e., words he has never used independently in the past) by using the app across the day. She embeds natural opportunities throughout the day for Albert to use the iPad to answer questions and initiate responses. Throughout his daily routine, when he must respond to questions and comments from teachers and peers and initiate communication, the teacher waits five seconds. If Albert responds using appropriate vocabulary, the teacher or his peers reinforce him by commenting on his communicative attempt or providing him with the item he requested. If he does not respond using appropriate vocabulary, the teacher models the correct use of the word or phrase on Albert's iPad by touching the graphic symbol, and asks him to repeat the response. The teacher or another staff member will add to the lexicon of pictures as his vocabulary increases and different phrases and words are required. Progress is monitored by counting the number of times Albert uses the new vocabulary and phrases on the iPad across days. The graph in Figure 1 shows how his progress is monitored over time.

Scenario 2: Chris

Chris is an 11-year-old male with a diagnosis of intellectual disability. He has intellectual functioning in the moderate-severe range. He attends a public middle school, where he spends the majority of the day in an inclusion classroom with pull-out services for remediation. He follows an adapted curriculum based on common core standards and functional skills and receives occupational therapy as a related service. No hearing or vision deficits have been reported.

In mathematics, Chris is able to add and subtract double digits independently without regrouping. He is adept at using a calculator for multiple-digit problems, with regrouping for multiplication and division problems. Chris is in an inclusive setting for mathematics class, but he does receive one-on-one remediation in the resource room. One of his goals is to develop fluency in solving

Screen Shot from Sono Flex app



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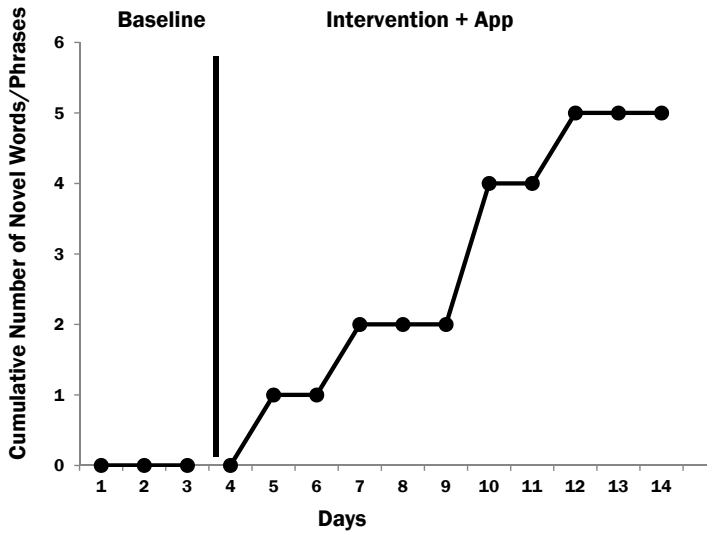
basic math facts. His teacher would like him to have an option for doing independent practice work on math problems while he is in the inclusive classroom. Math Bingo (abcya.com) is a tool that is being used to provide Chris with independent practice on basic math skills.

Math Bingo is easily accessible to students with varying abilities. The game-like nature of the app is engaging for learners, as is the use of bright colors and the option to choose the character the student will be. In addition, the difficulty level of the math problems is adjustable. The teacher can choose the operation that a student may need to practice (i.e., addition, division, or a mix of operations). During independent practice activities, Chris will be presented with a math problem at the top of the screen. He will complete the calculation and choose the correct

Figure 1. Albert's progress.



Albert's progress on the number of novel words/phrases used before and during the implementation of the app.

answer from the bingo card. A correct answer is marked with a funny/smile face, and when a row or column is completed he wins the game. A screen from Math Bingo is shown in the sidebar, Screen Shot of Math Bingo App.

The program records the time it takes for Chris to complete the problems, along with the number of incorrect responses. This allows the teacher to monitor progress, as sessions can be compared. If Chris is making adequate progress, the teacher continues to provide the app as an independent practice activity. If Chris is not making adequate progress, the teacher provides more guided practice activities on math facts before providing Chris independent access to the app. The app allows Chris to play the game with classmates or work on math skills independently.

Scenario 3: Sung

Sung is a 15-year-old female with a diagnosis of multiple disabilities. She has spastic cerebral palsy, a mild vision impairment, and moderate intellectual disabilities. She is able to communicate her needs and wants verbally, and she is able to initiate and maintain conversations with her peers and school staff. Sung requires a barrier-free environment, as she ambulates with the aid of a walker. In addition to gross motor issues, she has poor fine motor control.

Sung attends a public high school, where she spends half of the day in a self-contained special education classroom and half of the school day in an inclusive setting. She follows an adapted curriculum based on common core standards, functional skills, and vocational skill development. She receives speech therapy, occupational therapy, and physical therapy as related services. In occupational therapy, Sung is learning to grasp a pencil and form manuscript letters correctly while handwriting. The app Dexteria, by Binary Labs (**http://www.dexteria.net/**), is designed to strengthen fine motor skills and address grasping and handwriting skills through three specific activities.

Using the *Apps Considerations Checklist*, Dexteria was found to be an appropriate tool to teach and reinforce this skill set because it addresses multiple skills through different activities, and each activity is accessible for someone with Sung's needs. The "Write it" activity teaches students how to properly form both numbers and upper and lower case letters by connecting strokes in sequence. The large size of the display is appropriate for Sung, as she does have a mild vision impairment. The audio component provides her with feedback if she makes an error, so

Screen Shot of Math Bingo app

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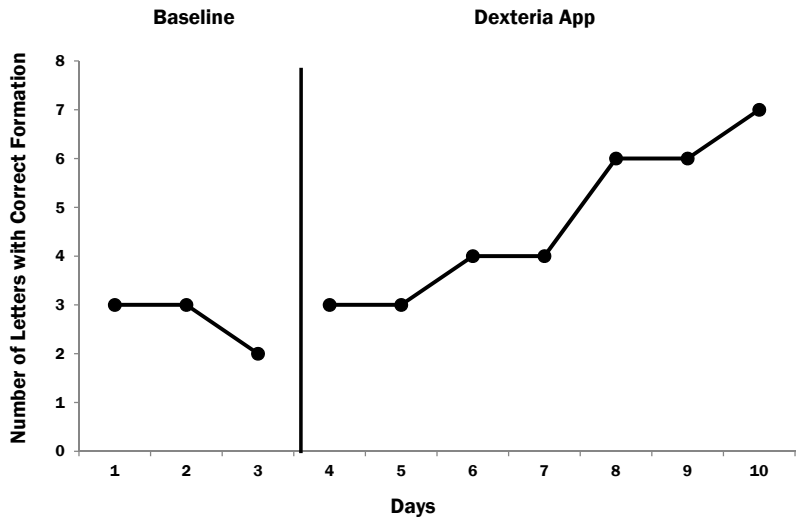
feedback is instantaneous. The "Pinch it" activity is designed to work on grasp and improve pencil grip and holding/grasping of other utensils. This activity is presented in the form of a game. Varying numbers of crabs come up on the beach, and the user is required to pinch each crab on the screen to eliminate it. The user attempts to eradicate all of the crabs in the shortest possible time. In the third activity, "Tap it," the user can use either hand to tap the targeted item on the screen. This activity is designed to practice finger sequencing and isolation. Ease of navigation between the three activities is also a plus for Sung if she is working independently.

Initially, Sung will need to be given direct instruction using a task analysis for operating the iPad and this particular app. However, once she has mastered operation of the iPad and the app she can practice the skills reinforced by the use of Dexteria on her own without the assistance of school staff.

Sung's occupational therapist and special education teacher decide to monitor progress on the outcomes of the Dexteria sessions as well her progress on correct formation and size of manuscript letters when she is required to write her name and address. Prior to beginning with the app, they collect baseline data by asking Sung to write her name and address and recording the number of letters of her name and address that are written with correct letter formation (this has been operationally defined by the teacher). They then give her the opportunity to use the Dexteria app on a daily basis. Progress on the domains of the Dexteria app can be measured, even when Sung is working independently, because the program records the outcomes of each session. Sung also is asked periodically to write her name and address again, and the teacher records the

number of letters written using correct letter formation and size. If she is making adequate progress as judged by analyzing a line graph (see Figure 2), the teacher has her continue to the app independently. If she is not making adequate progress, the teacher will teach letter formation using a graduated guidance procedure while allowing her to use the Dexteria app as a supplementary activity.

Figure 2. Sung's progress.



Sung's progress on the number of letters written with correct formation before and during the implementation of the app.

Summary

The teachers of each of these students used the *Apps Consideration Checklist* to select apps that were appropriate for the learning characteristics and objectives of their students. By doing this, the teachers were able to effectively teach skills to their students using an app. The teachers also carefully planned how they taught the skills using the app, and ensured that they had procedures for monitoring student progress.

Author Notes

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APPlication II: Matching Apps for Students with High-Incidence Disabilities

Shannon Sullivan

In this chapter, we provide three examples of how teachers of students with mild disabilities may use the *Apps Consideration Checklist* to determine a good match between the features of an app and the student characteristics as they work toward mastery of an instructional objective. The examples show how teachers develop procedures to teach the skill using the app and design assessment procedures to monitor progress.

Scenario 1: Jeremy

Jeremy is a seventh grade student who follows classroom discussions well and contributes at least as many details as his peers, but who freezes up when he has to write multi-paragraph responses to questions. Jeremy had average grades in the early elementary school years, but as expectations for written work increased his scores on written tests dipped to the point of failure and he started to forget his homework assignments frequently.

Jeremy has been diagnosed with attention deficit hyperactivity disorder (ADHD), and his poor motor planning, distractibility, and weak pencil grip make writing an arduous task. He often tries to rewrite his letters to make them more legible. He also reports being surprised that his classmates finish

their work before he does, especially on topics that are of high interest to him that he could easily discuss at length. The subjects in which he is having success are those that require short written answers, oral responses, and manipulation of numbers.

After a midyear IEP team meeting at the end of the second quarter, his team wrote a new goal: Jeremy will demonstrate understanding of social studies content by producing paragraphs that include a topic sentence and at least three supporting details. His IEP states that he can hand in work in an alternative format as long as he meets the criteria for mastery outlined in the assignment. The team determined that the teacher would evaluate an app that would enable Jeremy to record a digital audio file in response to social studies assignments requiring written products. The teacher located the app, Audioboo (**http://itunes.apple.com/us/app/audioboo/id305204540?mt=8**), which allows users to speak their responses, tag main ideas, and include an image to reinforce a concept. It was decided that this app might help Jeremy demonstrate his understanding of the content area and allow him to show what he knows about the content while avoiding the hurdle of producing written language.

Using the *Apps Consideration Checklist*, the teacher decides this app is a good match for Jeremy because he has the physical ability to access the app, he has the auditory and visual skills necessary to use the app, and the app would provide him with a way to demonstrate his knowledge without the need to write his responses. Cognitively, Jeremy can understand the feedback provided by the app and can easily navigate through it. As he grows as a writer, the app will remain an appropriate fit. He can record for longer periods of time as his responses become longer and more detailed, and he can add an unlimited number of tags (or categories) that allow him to increase the complexity as he learns more about including relevant details in his work.

A member of the technology team at school met with Jeremy for three sessions (about 15 minutes each) to teach him to use the technology and to practice making the simple podcasts on social studies topics that are of interest to him. For example, in one recording he described different types of foods from cultures that he learned about in social studies class. To teach the skill, the trainer first modeled the use of the technology, and then worked with Jeremy while he used the app (providing prompts as needed), and then finally Jeremy used the app independently.

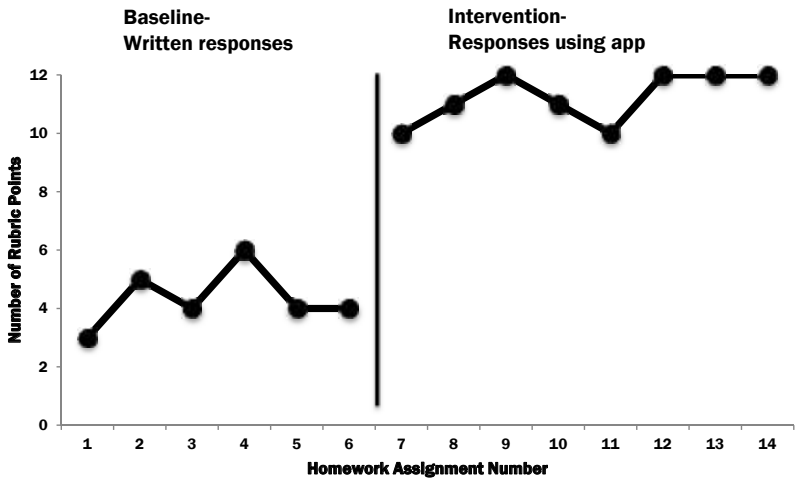
After Jeremy masters the technology, the teacher assigns the work as usual; the class is required to write a paragraph with a topic sentence and supporting details based on the social studies curriculum. However, Jeremy answers by recording his responses using Audioboo and shares it with the teacher via school email. To evaluate progress using the app, the teacher uses the same rubric originally developed for written responses; she judges the quality of the responses on four components: produces a topic sentence, produces one supporting detail, produces two supporting details, and produces three supporting details. Each component is given points on the rubric on a scale of 0–3 based on correct use of grammar, sentence formation, sentence complexity, and accuracy of content. She keeps data in the grade book by recording Jeremy's grades on responses to homework assignments requiring students to produce written responses in paragraph form. To monitor the effectiveness of the app, she graphs his point totals on his paragraphs produced prior to and following use of the app (see Figure 1).

Scenario 2: Olivia

Olivia is a 9-year-old third grader who has been receiving special education support since preschool, when she was identified as having a developmental delay. In second grade she was classified as a student with other health impairments. She has some characteristics of ADHD and autism, but does not meet all the criteria for a diagnosis of either disability. She likes to read, talk about geography, and play with dinosaur models, and she works best with visual supports.

Olivia exhibits what her parents describe as meltdown behaviors such as kicking, biting, and aggressively bumping into others. These same behaviors occur at school, which often results in Olivia being removed from the classroom and missing access to the content being presented. Her team is interested in identifying the function of these behaviors so they can design an appropriate intervention plan, teach Olivia appropriate replacement behaviors for her aggression, and decrease the amount of time she is not in the classroom.

Figure 1. Jeremy's Progress



Jeremy's point totals on paragraphs produced prior to and following use of the app.

The teacher conducted a functional behavior assessment and reviewed the results with the team. They hypothesized that, after sitting for long periods of time in the classroom, Olivia acts out to escape from sitting and doing classroom work. The team developed an IEP objective that Olivia will remain in the general education classroom for at least 85% of the school day.

Olivia's teacher decided to evaluate the IEarned That app (**http://itunes.apple.com/us/app/iearnedthat/id366144564?mt=8**), which rewards students working on any goal. The student can access a visual image of a reward and parents or teachers can upload photographs into the app. The adult also writes in the goal the student is working on, and can customize how many steps it should take before he or she is granted that reward. Animated puzzle pieces fly into place to build an image of the reward. Students receive immediate reinforcement and also are able to see that the small increments of appropriate behavior add up to getting closer the larger reward. The app plays applause and vibrates when a puzzle is completed (and the goal is achieved).

Using the *Apps Consideration Checklist*, the teacher decides the IEarned That app is an appropriate match for Olivia's characteristics and learning objective. The app allows the teacher to customize the images and upload photos of dinosaurs or talking with others about geography as rewards, taking advantage of Olivia's visual strengths. It also allows the teacher to customize the number of puzzle pieces that must be earned to begin at a level of reinforcement that will be effective in maintaining Olivia in the classroom. The app has an intuitive interface, making it appropriate for a young child like Olivia, and she has the necessary physical, auditory, and visual skills to use it successfully.

To teach Olivia to use the app, the teacher begins by modeling the use of the app, and then works with her as she uses the app, providing prompts as needed until she can work independently. Olivia is taught to activate a puzzle piece if she has appropriate behavior when a timer sounds. When the puzzle is complete she earns a back-up reinforcement. To monitor progress, the teacher carries a stopwatch. Any time Olivia must leave the room because of

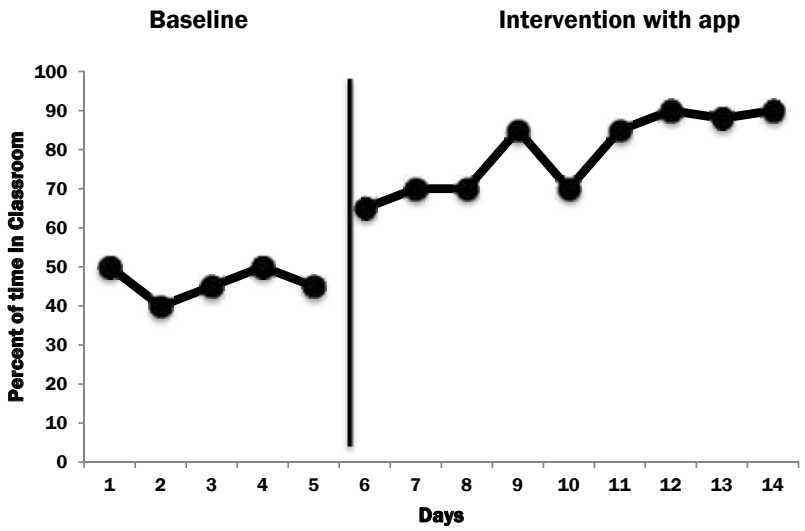
inappropriate behavior, the teacher begins the stopwatch. When she returns, she stops the stopwatch but does not reset it. She reactivates the stopwatch the next time Olivia leaves the room because of inappropriate behavior. She continues this process during the entire school day. At the end of the day, the stopwatch shows the number of minutes Olivia was out of the classroom. The teacher divides the number of minutes Olivia was out of the classroom by the number of minutes of possible time in the classroom, resulting in the percent of time Olivia was out of the classroom that day. This number is then subtracted from 100 to obtain the percent of time Olivia remained in the classroom that day. The graph in Figure 2 shows the visual analysis of the effectiveness of the program and the use of the app over time.

Scenario 3: Marco

Marco is a six-year-old kindergarten student who was identified as having a developmental delay at his eligibility meeting when he was four. His present performance levels indicate that his strengths include math calculation and gross motor skills, but visual motor integration is an area of weakness. His parents plan to see an optometrist to determine the need for glasses. He does not like to draw pictures; rather, he hurries through artwork so he can move on to his preferred activities of looking at and talking about his favorite comic book characters. An area of weakness is discussing events that occur in his environment, as he tends to want to talk primarily about his comics. He has one or two friends in his class at a time, and they tend to be children who share his somewhat eclectic interests.

Marco's teachers have used email and phone calls to maintain communication with his family. When asked how his day was or what he did, Marco talks more about his preferred topics or gives one-word responses. His family would like to know more about his classroom experiences, his interactions with peers, and his emerging interests (in addition to comics). They would like to help him learn to express his thoughts and retell the events of the day with at least two details per event. His IEP team develops an IEP goal to address this concern that covers both speech and language arts domains. It reads: Marco will retell a story about his day at school using at least three sentences of at least five words, and including at least two supporting details, on four out of five occasions. The app, My Journal (also known as Mister Rogers Make a Journal for Preschoolers, **http://itunes.apple.com/us/app/mister-rogers-make-journal/id333177396?mt=8**), was inspired by the classic television show,

Figure 2. Olivia's progress.



Percent of time Olivia remained in the classroom.

Mr. Roger's Neighborhood. Using an interface with a minimal amount of text, the student can select a topic for the journal entry. He or she can then select from a limited number of sentences, as well as pictures that appear to have been drawn by a child. The student can explain what he or she did on the playground as an opener or main idea, for example, and then can select from a list of activities. The art can be created on the fourth and last page of the journal, and the student can customize it using simple and familiar drawing tools such as digital stamps, virtual crayons, and erasers. The last page of the story can be emailed to parents or printed from a photo library, which could jump start a conversation about the day. The topics (Pretending, Playtime, Books, At School, and When I Get Mad) recycle the art from each section so the student is able to generalize what he or she learned in one topic and apply it to another one when experimenting with new topics.

The teacher evaluates the app using the *Apps Consideration Checklist* and determines this is an appropriate app for Marco. For example, Marco is a student who responds to visual feedback but is overwhelmed by too much auditory feedback. The My Journal app has auditory feedback that is always paired with the text and graphics, but it can be turned off or set to a low level. While the size of the text and contrast cannot be changed, the design is simple and uncluttered enough that it will not require any adjustments to meet Marco's visual needs. In terms of cognitive demands, the visual information is concrete, auditory cues are provided to prompt Marco in the use of the app, and no reading skills are required to operate the app. Marco has the physical skills needed to access the app, as he is able to draw and turn pages with one finger. His teacher teaches the skill of retelling the story to Marco using My Journal for one trial each day. At the end of the day, the teacher asks him to think about something that happened that day that he would like to tell his family or other teachers. The teacher writes a task analysis of composing a story using the app, including the steps of selecting a topic, selecting a setting, and selecting icons to complete sentences. She teaches the skill using a system of least-to-most prompting.

When Marco arrives home each day, his family asks him to show them the journal entry he created and tell them about the story he wrote that day. The teacher taught the family the procedures to use during the storytelling time. The family asks Marco to, "Tell me about your day," and waits a few seconds for him to initiate a response. If he tells a sentence, the family praises him and repeats what he told them. If he does not tell a sentence, they model an example of what he should say and ask him to repeat the model. They record how well he did on the story telling using a data sheet the teacher has included in his home-school notebook. The teacher uses this to monitor progress.

Summary

The teachers of each of these students used the *Apps Consideration Checklist* to select apps that were appropriate for the learning characteristics and objectives of their students. By doing this, the teachers were able to effectively teach skills to their students using an app. The teachers also carefully planned how they taught the skills using the app, and ensured that they had procedures for monitoring student progress.

Author Notes

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